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August 21, 1984

Separates

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Particles and Fields— Ionosphere

5515 Interactions butteen wayon and particles LONGE INSELS WAVES IN FEWITE-4 PLASMAS, DESTABILIZED BY PLFFIDIN BEAMS

First Books 6. Mighbolo (Migh Altitudo Observatory, Nacional Center for Assorberic Research, Boulder, (0.80307), B. Coppi (Physics Department, Massachusetts Institute of Technology, Larbridge, Ma 02139)

The lines and quasilinear theories of lower hybrid waves in a finite-f inhomogeneous plann with electrons arreasing parallel to the magnetic field are standed. These waves are found to be unstable for very low-b and to be stabiliand in little-0 planeau (p. 20.15, typically). The quantil-near fredback of unalable waves on the lon distribution function is shown to creuit in leading of four perpendicu-lar to the equilibrium asymptic field, Analytic payreasions for the los temperature changes are presented. Thus, upsta-ble lover hybrid wives are condidates for detection in the cal some of the Earth, whose they may be responsible

J. Graphys. Bes., A. Pagar 4A1011

PARTICLES DURING LABOAU RESORANCE INTERACTIONS WITH UNIESTLER HOOK MAYES

S. Hisicovic, (STAR Lab. Stanford University, Stanford, CA
94105), U. B. Loan dod R. A. Nellivell
The time avelenged equations of notion derived by Imam and
Thisicovic, (1982) are used to a test particle study of Landeu resonant interactions of whisiter sode waves and enargastle particles in the magnetosphore. By compating inditivitual particles replectates, it is shown that the pitch
angle scattering and averay exchange is significantly
different for the two classes of particles, trapped and untrapped. The trapped particles are characterized by a bounded phase warietion, the notrapped particles whilst
unbounded phase we risk ion. The threshold wave abserted
field intensities nice miscratic agulation is carried out
to departing the presidented election flux that would be
induced as a result of these Interactions. It is group.

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that for typical parameters the resulting procipitation fluxes for Landau resonance interactions are much smaller than those induced in gyrorosanance interactions, even for many (feld intensities that ore such higher than the trapping threshold. (Landau resonance, scattering, trapped

545 lonospheric disturbances
ELECTRIC CURRENTS ABOVE SAINT-SANTIN 3. A
PRELIMINARY STUDY of disturbances, JUNE 6, 1978;
MARCH 22, 23, 1979.
G. Mazeudier, (Centre de Recherches en Physique de
YEnvironnement, 4 Avenue de Neptone, 94100 Saint-Maux,
Francal

Findingnement, 4 returns to Neptune, 94100 Saint-Maur, France)

The paper presents a praigninary work on ionospheric electric current disturbances derived from the measurement of the Saint-Sainth incoherent Scatter radar.

The lonospheric alectric current disturbances mainly result from the influence of two dynamous. The first, the lonospheric dynamo is generated by the thermospheric neutral winds blowing across the geomagnetic field; the second, the solar wind/magnetosphere dynamo is produced by the solar wind flow around the magnetospheric cavity.

In this paper three coses of ionospheric electric current disturbances are studied. The first of these, on June 5, 1978 illustrates the sole influence of the machanism of direct, penetration of magnetospheric convection electric field generated by the solar wind/magnetosphero dynamo. The sacond case on March 22, 1978 is the first day of a storm the electric current disturbance observed on this day is similar to the one observed on June 6, 1978, but it occurs when the thermospheric circulation seasa to be disturbed it the third event on March 23,

5580 Wave propagation
WARE STATTERING BY AN IRREGULARITY SLAB EMBEDDED IN A
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STRATIFIC MEDIUM — APPLICATIONS TO IGNOSPHERIC PROPAGATION TO INTERPRETACION TO INTERPRETACION TO STRATEGICAL RANGE (Department of Electrical and Computer Regineering, University of fillings at Urbenna-Champaign, Urbenna, lilinots, 61801), C. H. Liu Plans wave scattering by an irregularity plan ambedded in a linearly stratified isotropic sodium is studied under single scatter approximation. In addition to regular refluction from the stratified background, both the incident and the reflected waves are scattered by the random irregularities. The behavior of the usparturbed field in the neighborhood of the turning point is accurately taken into account by using the full wave solution. The scattered fields can be interpreted in terms of the Bragg condition statise to the case of the wall-known Bonkar-Cordon form, but with four terms accounting for the reflection effect of the turning point on both the unparturbed and scattered waves. The case of elengated irregularities is studied in detail. Analytical capression for the angular spectrum of the average scattered field intensity is derived and its physical usaning discussed. In comparison with the case where the background sedium is phongeneous, the relicion to the two-dimensional Bookar-Cordon formula is nierified. Applications to the W-propagation in the disturbed ionosphare will be discussed. (Nave propagation, scattering, resonce sunsing).

3500 wave propagation
FIRST OBSERVATIONS OF 140 MRK PLASMA-LINE BACKSCATTER
DUPING MEATING Extra Heart At. Tropps
A. Redherg (Uppsale loncaptoric Observatory, 6-755 90
Uppsale, Sweden) B. Thide, K. Boetrom, H. Darblom,
R. Kopks and P. Stubbe



August 14

For more information; with AGU Fall Meetings, 2000: Florids Avenue, Washington DC 20009, or call AGU toll free 4, 8004 24 or local 462-6903 - Meet [P.A.

3 weeks

In September 1983 VIF plasma-line backeratts was obtained at Kiruna, Swaden, from the ionosphere illestobtained at Kiruna, Swaden, from the ionosphere illestnated by atrong ill radiation from the Demandary of the best of the length of the head of the demandary of the shalfted plasma-line was observed daring two plasma-line was never observed then critical. The plasma-line was never observed call the intensity was very variable to time, plasma-line observed the intensity was very variable to time, plasma-line plasma-line was done to perfect the plasma-line partial line of the heating was done to perfect the plasma-line partial line of the heating was done to perfect the plasma-line perfect was the perfect was the perfect was perfect was presented by the perfect of the perfect was the perfect was the perfect was perfect was perfect to the perfect was the perfect was perfect was perfect was perfect was perfect to the perfect was perfect to the perfect was perfect was perfect was perfect was perfect to the perfect was perf

Yews

Reviewing NASA Research

A recent report by NASA's Space and Earth Science Advisory Committee cautions against assigning the space agency's research and analysis efforts a lower priority than flight operations. If pre- and post-mission science continue to take a back seat to the actual building and launching of spacecraft, the report warns, it may eventually compromise NASA's ability to ensure U.S. leadership in space science.

The report was written by a working group consisting of both NASA personnel and earth and space scientists from the academic community. The group was asked in May 1983 to examine the health of the research and analysis (R & A) program conducted by NASA's Office of Space Science and Applications (OSSA) in the earth and space sciences. While the group found that the quality of research management by scientists at NASA Headquarters was "impressive," it also identified a critical shortage of cash for R & A programs. According to the report, "the immediate requirements involve an increase of about \$10 million in each of the Astrophysics, Earth Science and Applications, and Solar System Exploration divisions, thereby establishing a new base funding level for these activities."

Part of the problem with inadequate R & A funding arises when projects such as Viking and Voyager are perceived to be ended as soon as the spacecraft reach their destinations. After the Viking spacecraft landed on Mars in 1976, for example, funding for the project declined sharply, even though impor tant scientific data were still being returned well into the 1980's. With little NASA money available for data reduction, the privately operated Viking Fund resorted to passing the hat in order to keep a limited Viking data analysis program going.

The committee's report emphasizes that data analysis, synthesis, and interpretation are an important part of any healthy R & A program. Specifically, the report recommends that "OSSA should, in consultation with the scientific community with which it collaborates, develop an overall plan for data management, computation, and communications that is broad enough to serve the various OSSA scientific endeavors."

Another important aspect of R & A that needs beefing up, according to the report, is basic research into new spacecraft detector and instrument technology, which must be maintained for NASA to conduct state-of-the art science. Laboratory and experimental equipment used by NASA-sponsored researchers has also fallen into disrepair or become outmoded while limited funds have been spent elsewhere, according to the report, to the point where "many European and Japanese laboratories are equipped with instrumentation far superior to our own. It is mportant to the country's long-term technological well-being and to NASA's future in particular that this situation in universities be

Special IGR-B Issue: Mapping the Seafloor

JGR-B will publish a special issue in 1985 focusing on the results obtained by using a variety of new seafloor mapping tools (e.g., SEA BEAM, SEA MARC I and II, GLORIA, GEOS 3, and Seasat radar al timetry). Liberal use of color and large-format black and white figures is encouraged. Special reduced rates for color will apply. Papers describing results obtained ing these new techniques in a variety of tectonic environments (e.g., mid-ocean ridges, active margins, passive margins, seamounts) are solicited as well as papers describing instrumentation and data processing and interpretation techniques. Sub nission deadline is September 30, 1984. Publication is planned for July or August 1985. For further information contact Gerald Schubert, Editor of JGR-B, or Robert Detrick, Associate Editor for this

Gerald Schubert, Editor Journal of Geophysical Research
Department of Earth and Space Sci-

University of California Los Angeles, CA 90024 (telephone: 213-825-4577 or 824-5665)

Robert S. Detrick Graduate School of Oceanography Narragansett Bay Campus University of Rhode Island Kingston, RI 02881

With regard to NASA-funded theoretical and predictive modeling work, which both help to shape mission designs and benefits from their results, the committee recommends that NASA encourage more "interdisciplinary collaborations and activities such as

small workshops that foster new ideas and

amount of R & A money should be set aside

for "high-risk" research ventures in order to

should continue to receive multi-year funding

ing one short contract year, and that NASA

and non-NASA proposals should continue to

be judged by the same standards of peer re-

view. The balance between work performed

by university, NASA field center, and other

laboratory researchers was found to be good overall, with the exception of "a few discli-

pine areas, such as Land Processes, where

particular attention neds to be paid to in-

system exploration and climate research.

& A funding. An infusion of \$10 million to

It would also allow a start on a "Planetary

for many scientists to the treasury of planetary data that has been accumulated from

past missions." Similarly, additional funds for

the earth sciences would mean more efficient

A budget even in times when no spacecraft

are being launched, so that there can be a

continuous cycle of scientific input and out-

put from the actual missions. As the report

states, "the missions are the means by which

Probable Maximum

A Federal Interagency Work Group on

Probable Maximum Flood Assessment is cur-

rently studying the problem of hydrologic de-

sign based on the probable maximum flood (PMF). Of particular interest are the calcula-

tion of PMF probabilities, the accuracy of

such estimates, and the development of a

standardized methodology for probabilistic assessment of severe floods.

In an effort to establish the state-of-the-art,

the work group is interested in obtaining copies of papers or reports that are related to

the subject. Please send relevant material to

gineering, University of Maryland, College Park, MD 20742.

Upcoming Hearings

Congress returns on September 5 from its recess for the Republican National Conven-

tion and the August district work period. Ex-

pect rapid changes in schedule during the next several weeks as the election approaches

ference committees have been tentatively scheduled for the coming weeks by the Sen-

ate and House of Representatives. All de

and times have yet to be announced; the

gress, see AGU's Guide to Legislative Information and Contacts (Eas, August 28, 1984, p. 675). TBA: Markup of Safe Drinking Water Act

(P.L. 93-523) amendments (H.R. 5959) by

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Beginning in 1985

Reviews of Geophysics

and Space Physics

will be titled

Reviews of Geophysics.

Approximately 800 pages

to be published in · Volume 23, 1985.

The following hearings, markups, and con-

in Congress

Richard H. McCuen, Department of Civil En-

Flood

OSSA contributes to progress in the space

use of microwave and Landsat Thematic

reasing the breadth of university participa-

so as to not be swamped with paperwork dur-

encourage fresh ideas and innovation. The

committee believes that NASA researchers

cross fertilization." In addition, a certain

Commerce Committee

Management plans to be consistent with state management plans by the House Merchant Marine and Fisheries Committee.

tration Act reauthorization (S. 979).

TBA: Conference on legislation (S. 1097) to consolidate certain programs on satellites and the atmosphere within the National Oceanic and Atmospheric Administration.—BTR

Geophysicists

David E. Dunn, Dean of the College of Sciences at the University of New Orleans, will become Dean of Natural Sciences and Mathematics at the University of Texas at Dallus on

While the report points out that a few R & A programs within OSSA appear to be adequately funded (upper atmosphere research is cited as an example), others, such as solar James Hughes was presented with a plaque Atmospheric Electricity in recognition of his discerning and perceptive support of atmo-spheric electrical studies on a global scale. would benefit from 20 to 30% increases in R the solar system exploration program, for example, would not only allow laboratory Research, Hughes has been instrumental in equipment to be upgraded but would provide promoting basic research that has provided enough money for enhanced Halley observations and data reduction, more extensive U.S. participation in foreign missions, and support volcanic eruptions, the production of atmospheric ions, and the role played by ocean for Mars and Voyager Uranus data analysis. Data System Program permitting easy access

deceased

John D. Isaacs, 70. An AGU Life Fellow and a member of the Ocean Sciences Section.

An AGU Life Fellow, he joined AGU in

and earth sciences; they are not in themselves **Geophysical Events**

tin is available in the microfiche edition of Ear as a microfiche supplement or as a paper reprint. For the microfiche, order document E81–008 at \$2.50 (U.S.) from AGU Fulfillment, 2000 Florida Avenue, N.W., Washington, DC 20009. For the paper reprint, order SEAN Bulletin (giving volume and issue numbers and issue date) through AGU Separates at the above address; the price is \$3.50 for one copy of each issue number for those who do not have a deposit account. \$9 for those who do not have a deposit account. posit account, \$2 for those who do; additional

Volcanic Events

Kilauea (Hawaii): Phases 22-23 of 1983-

Mount St. Helens (Washington): Deformation, seismicity, and SOs emission drop. Arenal (Costa Rica): Lava production slows

as strong tephra ejection begins. Llaima (Chile): Dense columns of dark ash

deformation increases.

Manam (Bismarck Sea): Strombolian activi

Fiii area from March eruption. Eina (Italy): Lava production and strombo-Atmospheric effects: El Chichón aerosols

Etna Volcano, Sicily, Italy (37.73°N, 15.00°E). All times are local (= UT + 2 hours).

"The southeast crater eruption that began April 27 was continuing in early August with more or less intense strombolian activity, accompanied at irregular intervals by violent expulsions of clark ash. This activity produced a scoria cone (about 50 m high) higher than the rim of the southeast crater. The ef-

the Health and the Environment Subcommittee of the House Energy and Commerce

TBA: Hearing on nuclear waste program planning by the Energy and the Environment Subcommittee of the House Energy and

TBA: Mark up of legislation (H.R. 4589) that would require federal Coastal Zone

TBA: Conference on the Export Adminis-

at the recent 7th International Conference on Throughout his career at the Office of Naval new insights into various phenomena, such as formation of lightning in thunderclouds and spray particles in the formation of raindrops.

The following AGU members are recently

he joined AGU in 1950. Finally, the committee calls for a stable R & Robert C. Miller, 85, died June 11, 1984.

> Ernst J. Opik, 91. An AGU Life Fellow and a member of the Planetology Section, he joined AGU in 1961.

This is a summary of SEAN Bulletin, 9(7), July 31, 1984, a publication of the Smithsonian Institution's Scientific Event Alert Network. The complete bulle-tin is available in the microfiche edition of Eos as a copies of each issue number are \$1. Subscriptions to SEAN Bulletin are available from AGU Fulfillment at the above address; the price is \$18 for 12 month-ly issues mailed to a U.S. address, \$28 if mailed else-

1984 E Rift Zone eruption

emitted from crater.

Rabaul (New Britain): Seismicity declines:

ty: frequent debris avalanches. Home Reef (Tonga): Large pumice rafts in

lian activity continue from St. crater; strong explosions from central and NE craters. and times have yet to be announced; the committee, subcommittee, or conference committee holding the hearing, markup, or conference will be setting schedules in the next few days. All offices on Capitol Hill may be reached by telephoning 202-224-3121. For guidelines on contacting a member of Congulation and ACLIS Childs to Legislating Information.

The quoted material is a report from Ro-

SAN FRANCISCO • DEC. 3-7 ASLO WINTER MEETING

Abstract Deadline Sept.12 Call for Papers (including

abstract specifications) was published in Eos, July 3 and August 14

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1 week

fusive activity took place from vents around 3000 in above sea level that changed their positions continuously. On August 6, two effusive vents were active along the old rim of the southeast crater, one on the NE edge, the other on the southern edge. Some rather well-fed flows originated from these vents. The final flow direction was always E, toward the Valle del Boye, During this period, the lava flows never advanced below 2600 m. The lava field that formed from this continulon. vicental forement in elderary lone and position) effusive activity was larger than 1 km in extent. The volume of lava emitted can be estimated at around 8-10 x 106 m.

"An increase in central crater eruptive activity was recorded in July. From the west vent (Bocca Nuova), violent expulsions of gray ash continued at irregular intervals. while on the floor of the vent, violent and continuous strombolian activity continued. At times, incandescent lava rose higher than the crater rim. The larger east vent (The Chasm) of the central crater, after showing activity similar to that at Bocca Nuova in mid-July, was the source of violent activity on July 19 between 1300 and 1700. Very violent strombolian activity ejected incandescent lava fragments about 1 m in diameter to 500 m from the crater rim. The southern and northern flanks of the central crater were most often impacted by the lava fragments (their average diameter was about 30 m, and they fell within

an average radius of 300 m)." The pilot of an aircraft flying near Etna at 1542 on July 19 observed an eruption cloud that reached about 6.5 km altitude. At 1613, the NOAA 7 polar orbiting satellite showed a plume extending 100 km east from Etna.

"After this, The Chasm remained obstruct-

ed until August 1, when it reopened (at 1900) with the expulsion of old material that fell outside the crater rim. On August 6, this vent was once again obstructed (around 1500) as the result of internal landslides.

The northeast crater, inactive since February 1981, had a violent explosion that ejected old material on July 20 at 1715. Since then, strong emissions of vapor and gases occurred from the small vent that formed near the

Information Contacts: Romolo Romano, Istituto Internazionale di Vulcanologia, Viale Regina Margherita 6, 95123 Catania, Italy; Michael Matson, NOAA/NESDIS, Room 510, World Weather Building, Washington, DC

Meteoritic Events

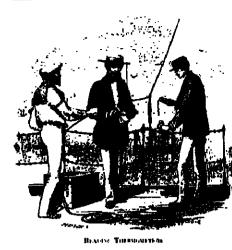
Fireballs: W Australia (two); N California, Oregon (two).

Earthquakes

					Depth	
Date	Time, UT	Magnitude	Latitude	Longitude	of Focus	Region
July 5 July 19	0522 0656	6.5 Ma 4.9 mb Lg	6.09°S 52.91°N	154.42°E 4.20°W	30 km 20 km	Solomon Island United Kingdor

Information Contacts: National Earthquake Information Service, U.S. Geological Survey, Stop 967. Denver Federal Center, Box 25046, Denver, CO 80225.

The Oceanography Report



The focal point for physical, themical, geological, and

Editor: David A. Brooks, Department of Oceanography, Texas A&M University, College Sta-tion, TX 77843 (telephone: 409-845-5327).

Donde Va? An Oceanographic Experiment in the Alboran Sea

The Donde Va Group!

Introduction

The Million II

During June-October 1982 an international consortium of occanographers studied the circulation of the western Alboran Sea in an experiment entitled "Donde Va?." Although the English translation of this title is "Where does it go?," our goals were more ambitious than the name implies. In this overview of Donde Va? we will discuss the oceanographic background of the region, the objective of the experiment, and the preliminary results.

Oceanographic Background

The Alboran Sea is the westerminost of the many basins that comprise the Mediterranean Sea. A narrow (10-30 km) current of Atlantic water (fresher than 36.5 salinity) flows eastward through the Strait of Gibraliar with a volume transport of about 1.4 x 10° m⁶/s, while saline Mediterranean water (38.4 salinity) flows westward beneath it with a transport

that is about 4% less. This two-layer flow maintains the salt and water balance of the Mediterranean which annually loses about 1 m over its surface through the excess of evaporation over river runoff and precipitaion [Lacombe, 1984]. While intuition might lead one to anticipate that the Atlantic water entering the Mediterranean would be found along the Moroccan coast (i.e., turning to the right upon exiting the strait), in fact the inflow is found near Spain, where it forms the northern half of a basin-wide anticyclonic gyre [Lanoix, 1974; Cheney and Doblar, 1982; Parrilla and Kinder, 1984]. There have been several model studies of the gyre [Whitehead and Miller, 1979; Naf. 1978; Preller and Hurlburt, 1982], and it is nearly always detectable in satellite infrared images [Phillips and Harang, 1982].

Objectives

The primary objective of the experiment was to understand the dynamics and the variability of the anticyclonic gyre by using nu-merical modeling, remote sensing, and field measurements. Our hypothesis was that the Atlantic inflow is the primary forcing mechanism for the gyre, so that if we made synoptic measurements of the inflow and of the gyre, and compared these measurements to nu-merical model simulations, then we could increase our understanding of the gyre dynam-

The experiment addressed numerous secondary questions including

i. What is the structure of the Intermedi-

ate and Deep Water Ilows, and how do these waters contribute to the Mediterranean out-2. What is the biological and chemical in-

fluence on the gyre's strong ocean color sig-nal, and how is this signal related to the physical structure of the gyre? 3. How does the strong front along the northern limb of the gyre affect the atmo-

spheric marine boundary layer, and how does the marine boundary layer then affect remote sensing data? 4. How are the surface signatures of the gyre, as measured by satellite and aircraft

sensors, related to the subsurface structure of 5. How does atmospheric forcing influ-ence the gyre, both directly and through changes in the Atlantic inflow?

Preliminary Results

The experiment had three overlapping phases, all ending in late October 1982. The first phase began in October 1981 and con-

4 10 15 22 3 MOROCCO

Fig. 1. Salinity at 100 dbar, showing the structure of the Atlantic inflow and gyre at depth.

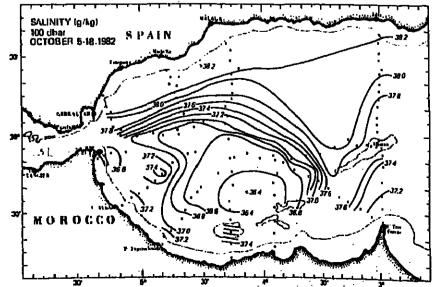
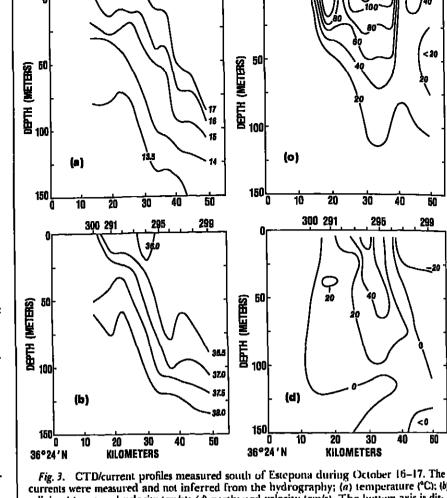


Fig. 2. Mean velocities from the current meters. The solid arrows are from instrument in the Atlantic inflow or gyre, while the dashed arrows (note scale change) were in the los er part of the Mediterraneau Intermediate water,



currents were measured and not inferred from the hydrography; (a) temperature (°C); (b) salinity; (c) eastward velocity (cm/s); (d) northward velocity (cm/s). The bottom axis is distance south of 36°24'N, and the top axis station location.

sisted of satellite monitoring (about 2 processed images per month) of the thermal surface features. The second phase began in June 1982, when five current meter moorings were deployed, a small hydrographic grid was occupied, and satellite image processing in-creased to about once weekly. During the final phase in October 1982, four ships occu-Gibraliar, and the Gulf of Cadiz (the area of ed stations in the Alboran Sea, the Strait of the Atlantic Ocean just west of the strait); four aircraft performed remote sensing and AXBT flights; a shore-based current measuring radar (CODAR) operated; additional melogical and aerosol data were collected: and all available NOAA 7 (advanced very high resolution radiometer, AVHRR) and NIMBUS 7 (coastal zone color scanner, CZCS) images were obtained. The meeting report from an October 1983 workshop contains a detailed account of the experiment and some early results [Parrilla, 1984]. We will briefly discuss the preliminary results of the intensive October 1982 phase.

The Structure of the Gyre and The Atlantic Inflow

During October 1982 the gyre was fully developed, filling most of the western Alboran Sea. Figure 1 shows the salinity at 100 dbar. based on data taken over 2 weeks from two ships. The deep part of the inflowing current can be inferred from the closely packed isohalines in the northwest, and the gyre as the low salinity (<37) water centered near 35°30'N, 4°00'W. This depiction of the saliniy distribution is probably close to the mean for the period, but the gyre displayed considerable variability during these 2 weeks. Satellite infrared images (see cover) showed large surface temperature changes, and three syn-optic aircraft AXBT surveys showed that the 30 km within 10 days.

Near the Strait of Gibraltar, geostrophic estimates of the Atlantic inflow relative to 200 dbar were about 1.4 x 10° m3/s in transport and maximum speeds were 140 cm/s. Hydrographic stations within 25 km of the Moroccan coast showed unexpectedly high gradi-ents, and currents computed from these data exceeded 100 cm/s.

Current measurements also showed high speeds with strong variability in the gyre and the inflow. Five short-period (4-5 hour) surface measurements of sonobuoy drift tracks showed that the core of the inflow was associated with a cool sea surface temperature and speeds of 120 cm/s. South of the inflow, the speeds in the gyre averaged 60 cm/s, al-though some higher speeds were measured. Surface currents measured by radar (CO-DAR) over a region extending 60 km south of Marbella (depending on interference and propagation conditions) were well correlated

farther offshore in 4 days, and that it had

multiple velocity maxima of 5-15 km width

were concentrated along the mooring line (Figure 2). These measurements show large temporal and spatial changes in the op-tical and thermal structure. Correlation with satellite images and other data showed that much of the temporal change was associate with variations in the structure of the Adanic inflow and gyre. Biological and nutrient concentrations also had a complicated and variable structure. Phosphate concentrations were nigher (0.3-0.7 µg at P-PO4) than was previ-

with geostrophic estimates and current meter data. CODAR measurements showed that the Stolterfothis the most abundant. center of the inflow current had a width of 15-30 km, that it moved more than 30 km

[Janopaul and Frisch, 1984]. During October, the current meters (Figure 2) showed the subsurface velocity core shifting between mooring 14 and 15, with the highest speeds at the shallowest meters (depths of 67-124 m) exceeding 80 cm/s. The best-resolved velocity section, taken with the CTD/velocity profiler south of Estepona, revealed a current of about 25 km width, 100 m depth (20 cm/s isotach), and surface speeds of 120-140 cm/s (Figure 3). This section also showed that in the highest horizontal shear regions of the current, large along-section velocities made the nonlinear terms in the momentum equa tions nearly as large as the Coriolis term. Generally, the geostrophic estimates appear valid, but details on scales of 10 km or less in the high shear regions may be inaccurate.

Optical, Biological, and Chemical Measurements

Simultaneous measurements of visible and infrared radiation from both aircraft (multispectral scanner and ocean color radiometer) and satellite (CZCS and AV(IRR) sensors clearly pictured the gyre and the Atlantic inflow (Figure 4). The CZCS images were geometrically registered to a Mercutor projection and atmospherically corrected for quantita-tive chlorophyll concentration and for the diffuse attenuation coefficient. These results and the aircraft data indicated that high chlorophyll concentrations were correlated with cool sea surface temperatures. Surface thermal fronts were coincident with ocean color fronts on the large scale, although differences appeared at smaller scales. Results of the CZCS showed suprisingly large daily changes in chlorophyll concentration and attenuation coefficient across the entire sea. Along the northern front formed by the gyre and the Atlantic inflow, chlorophyll changed from 1.05 to 0.45 mg/m³ and the attenuation coefficient from 0.15 to 0.07 within 24 hours. The cause of these changes is still under scrutiny. If the cause is either biological or physical, then the rapidity, areal extent and size of the changes will be a significant new result. In situ optical and biological measurements

higher (0.8-0.7 µg at P-PO4) than was previously found, and some high nitrate concentrations also suggested that upwelling or mixing may have been supplying nutrients to the photic zone. High chlorophyl concentrations were associated with the high nitrate. Distoms were strongly dominant, with Rhizosolenia

Submesoscale Thermal Features

Examination of the twice daily infrared images (fig.

ure 4) revealed tongues of colder and more nurbid water that were pointed toward the center of the gyre. They appeared first near the strait and then apparently were advected around the gyre at a mean speed of 40 cm/s [La Violette, 1984]. These features had a horizontal dimension of 10-20 km (compared to the internal deformation radius of 15-30 km) and a vertical extent, measured by AXBT sections, of at least 100 m. Salinity from a CTD cast obtained within one feature was in

Meteorology and Aerosols

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Cover. NOAA 7 advanced very high resolution radiometer (AVHRR) infrared images of the Alboran Sea collected as part of the Donde Va? experiment during Oc tober 1982. The dot and V in the images show the advection of two submesoscale features about the Alboran Sea gyre (the line designates a key section near the cur rent moorings (cf. Figure 2 of TOR arti-cle, this issue). A close examination of the images shows that other unmarked fea-tures were also being advected. Continuous monitoring of these cold-water fea-tures was possible because of the twicedaily (about every 12 hours) spacing of the NOAA 7 overpasses. After registration to a mercator projection (accuracy to km) and an atmospheric correction to arrive at absolute temperatures, analysis of the displacement of the cold water fea tures in successive images show their ap-parent origin east of Gibraltar, their average speeds of 40 cm/s around the gyre, and their apparent entrailment into the ing Atlantic water east of Git Illustration courtesy of The Donde Va Group, see TOR article, "Donde Va? An Oceanographic Experiment in the Alboran Sea," this issue.)

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the range of Atlantic water. During 15 days of cloud-free satellite images, nine features could be tracked most of the way around the gyre. Because they appeared to originate near the strait about twice per day (the same frequency as the NOAA satellite passes), we conjecture that the strong Strait of Gibraltar tides may influence their formation.

Shore stations and shipboard measure-ments, including soundings and aerosols, provided dense observation of the lower atmosphere. These data were obtained to check the influence of the atmosphere on the gyre {Cheney and Doblar, 1982; Bucca and Kinder, 1984) and on remote sensing measurements.
The marine boundary layer was modified by cooling and warming due to the air-sea temperature differences over the water masses on either side of the sea surface thermal fronts: The boundary layer over the colder water was 50 m lower than over the warmer gyre water, had a stable inversion layer overlaying a shallow surface layer, and had a greater concentration of smaller-sized perosols. Aerosol populations over the Alboran Sea (gathered by ship) were characterized by large diurnal variations in concentration, size, and chemical composition. On the average, sub-micron sized particle concentrations were approximately 50% greater over the colder water (probably trapped in the low level inversion), while concentrations of particles >1 micron were comparable in both areas. Wave data inferred from aircraft photography also showed smaller wave heights in the colder water. The correlations of these atmospheric parameters with oceanographic features can both complicate interpretation of remote sensing images and offer clues to useful anal-

Internal Waves

Nonlinear internal waves (often described as bores) have been known in the Strait of Gioraltar for decades. For the first time, however, our data show that these eastward-propagating waves often form ordered groups of short period (about 30 min) waves in the Albornn Sea, apparently as internal solitons [Os-borne and Burch, 1980]. These waves have sufficient amplitude (exceeding 50 cm/s in eastward velocity) to affect measurement programs and perhaps directly influence arger scale dynamics as well. The waves were common, forming during most semidiurnal tidal cycles but with varying strength.

Hydrographic observations in the Gulf of

Gulf of Cadiz

Cadiz showed Atlantic water near the Spanish coast flowing eastward toward the strait. The Mediterranean outliow appeared to move down five submarine canyons along the Iberian slope, mixing with the surrounding waters. There were several gyres or eddies in the dynamic topographies, including an anti-cyclonic gyre (near 36°20'N and 7°10'W) that has been detected in CZCS images. Velocity profiling south of Cape St. Vincent (extreme southwestern Portugal) indicated that the Mediterranean water was moving at speeds of less than 10 cm/s. In these data and compan-ion CTD data, the temperature and salinity at the core of the Mediterranean water fluctuated as much as I°C and 0.2 over either distances of a few kilometers or periods of a few days (spatial and temporal fluctuations on these scales could not be separated because of

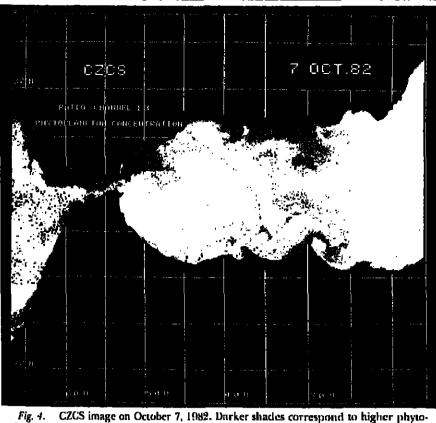
Numerical Modeling

Reduced gravity models (single active layer above a quiescent lower layer) used by Preller and Huriburt [1982] demonstrated the importance of both the magnitude and direction of the inflowing Atlantic water in the determination of the gyre dimensions. Inflow directed north of east, and thus conforming to the orientation of the Strait of Gibraltar, enlarged the north-south extent of the gyre. Increasing the magnitude of the inflow intensified the gyre and shifted it farther east.

When a westward-flowing lower layer was included, the importance of the bot pography became apparent. In cases of large inflows (>1.7 x 10° m³/s) with an initial northward component, the submarine ridge system near Alboran Island deflected the flow northward. This deflection eliminated the anticyclonic gyre west of the Island. Smaller inflows, such as the 1.4 x 106 m³/s estimated for October, resulted in a large anticyclonic gyre west of the island (Figure 5).

Deep and Intermediate Water

Hydrographic sections showed that the Deep and the Intermediate Water took separate paths through the Alboran Sea. The Deep Water flowed as a narrow (20 km) current against the base of the Moroccan contirent against the base of the Moroccan continental slope and then appeared at the eastern end of the strait along the southern side, much as predicted by Bryden and Stommel [1982]. The Intermediate Water, however, appeared to flow preferentially in the northern two thirds of the Alboran Sea, arriving at the agree and of the trait along the norththe eastern end of the strait along the northern side. The Deep Water flow was thus anti-cyclonic, like the shallow Atlantic water gyre, while the Intermediate Water flow was cy-



clonic. Two-layer numerical model experiments suggested that this pattern resulted from the influence of rotation on the Intermediate Water and of bathymetry on the

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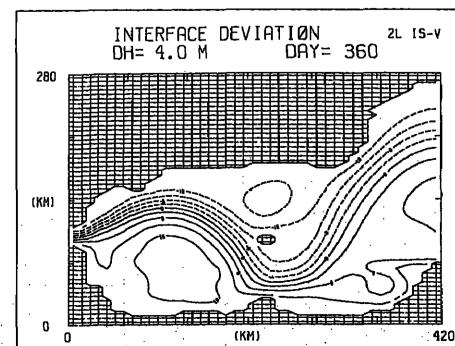
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Oceanography (cont. on p. 684)



g. 5. Pycnocline anomaly for a steady state two-layer model experiment. Upper layer we was 30 cm/s angled 21° north of east, and lower layer inflow was a uniform 0.2 cm/s across the eastern boundary. Positive contours denote a thickening of the upper layer (contour interval is 4 m).

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A Global Ocean Flux Study

John H. Steele

A major goal for oceanography in the next decade is an understanding of ocean dynamics at basin and global spatial scales and at time scales from the interaunual through the decadal. This understanding is not only of intrinsic interest and importance for the oceans themselves but is an essential component of the larger problems concerning the cycles of heat, water, and chemical constituent through the land, air, and sea. To the extent that the occans act as the "flywheel" for the total system at these longer time scales, our level of understanding of this component is likely to be critical.

The larger concerns are expressed in general national and international programs, such as the "global habitability" concept or the International Geosphere-Biosphere Program (Eos, February 21, 1984). The essential foundation for such biogeochemical concepts is a knowledge of the physical dynamics. The Global Atmospheric Research Program (GARP) and, more recently, the World Climate Research Program and its oceanographic components, Tropical Ocean: Global Atmosphere (TOGA) and the proposed World Ocean Circulation Experiment (WOCE), are aimed at providing the necessary knowledge of the zero-order (steady state) and first-order variability of the ocean-atmosphere sys-

The critical next step is to consider how we may link these physical studies to an energing understanding of themical fluxes within and through the ocean, particularly at they determine and are determined by long-term biological cycles and trends. The basic distribution of critical chemical constituents is observed in two major programs, GEOSECS and TTO (Transient Tracers in the Ocean). Follow-up programs are expected to continue through the next 5 years. To link these observations to the physical dynamics and to the biological processes, measurements are needed of fluxes of soluble and particulate phases and of the rates of transformation between these phases.

In the last few years there has been consid-

erable and rapid development of methods for the measurement of these rates. The use of sediment traps has revolutionized our picture of particulate transport rates in the deep ocean. A reevaluation of near surface production is in progress. Satellite color observations provide the potential for large-scale synoptic data. Deployments of benthic chambers at the deep ocean bottom can now measure fluxes through this boundary. Exchanges across the constal/ocean boundary are being studied intensively, as are questions of lateral transports to the ocean interior. It is recognized that there is need for further development of these methods, but, taken together, they provide for the first time the possibility to put numbers to many, if not all, of the critical rate processes.

Can these new techniques, combined with the programs of physical and chemical obser-

vations, provide a picture of the basic longterm chemical/biological dynamics at the basin or global space scales? Can we envisage a coherent program of development and de-ployment over the next 5-10 years? Do we have the conceptual basis, possibly expressed through numerical modeling, to explore the size and nature of such a program?

It is timely to consider these questions in the context of developments within the fields of chemical and biological oceanography and also in relation to the programs for study of the physical dynamics. There need to be close links between such programs, but the meth-ods for, and interests in the nonconservative tracers requires an independent approach.

Preliminary discussions had identified several key topics where concepts and technologies need to be evaluated: (1) sediment traps and large volume sampling methods; (2) production cycles and satellite observations; (3) exchanges across the benthic boundary, including shelf/ocean transports; (4) modeling simulations as planning tools; and (5) relation with existing physical and chemical programs

(WOCE, TTO). A meeting of experts in these areas was called by the Board on Ocean Science and Policy of the National Research Council to consider the feasibility of developing a program that would provide a coherent framework for joint studies and which could lead to a major field effort in the next 5-10 years. This meeting was held on February 14-16, 1984, in Washington, D. C.

The meeting discussed the topics and techniques listed above. The group also discussed fully the relation between a "flux" program and existing or proposed programs such as TrO and WOCE. In particular, it was recogsized that theoretical and numerical modeling studies could be used to link the physical dynamics with the chemical and biological processes. Work is required on the models that may be most appropriate for this pur-

From a general review of the present range of programs such as those measuring tracers (e.g., TTO), the varied studies using sediment traps (e.g., Sediment Trap Intercomparison Experiment and Vertical Transport and Exchange Experiment), and benthic flux work (e.g., Manganese Nodule Program), one major conclusion emerged. We need to study not only vertical but also horizontal transport of major "particle-reactive" components on space scales of basin or global dimension and on time scales from the interantual through decadal. Thus any coherent program must aint to view these interactions at the larger

A second major conclusion was that, although existing analytical and sampling tech-niques have the potential to provide answers on the appropriate scales, there is a significant prior need to test the capability of some techniques for larger scale use and, especially, to have a better understanding of the pro-cesses, physical, chemical, and biological, which drive the system at certain critical locations. Thus, a larger coherent program is envisioned for a time frame probably starting no earlier than 1990, but planning for this must be closely linked to a set of intermediate

objectives and field programs.
The following scientific objectives were proposed: (1) to define the rate of produc-tion of organic matter as a function of geo-

graphic location and time; (2) to define the rates of organic matter from the photic zone into the ocean interior as a function of location and time; (3) to define the transfer rates (by respiration, dissolution, and sorption) between phases as a function of time and location within the water column; and (4) to define the rates of flux between the ocean interior and the seafloor. It was agreed that certain immediate steps were needed as a buildup toward a fully developed program.

1. Remote Sensing: Satellite color images

would provide essential data to cover the range of space and time scales envisaged for ocean basin or global studies. Recent reports demonstrate the ability to use these data for estimates of primary production. Thus, the group strongly supported the proposed OCI (Ocean Color Imager) and the need to have it ntroduced into the next budget cycle so that the satellite may be in orbit for a time period overlapping the altimeter and scatterometer

flights (approximately 1990—1995). At the same time, the group realized the need to demonstrate the specific uses for OCI data in the larger-scale context (the major achievements using color data have been for mesoscale studies). Thus, a thorough study is required of existing data to determine the statistics of (1) data availability by geographic location and season (the problem of cloud cover) at the basin scale; (2) data variability as a function of location and space and time scales; and (3) the mean values for

use in productivity calculations.

2. New and Recycled Production in the Photic
Zone: There is a significant discrepancy between direct (short-term, "bottle") measurements of primary production in the photic zones and indirect (long-term field data) estimates derived from combining chemical and physical measurements. The differences (involving factors of 2-5) may be due in part to semantics (what is "production," what is "new" and "recycled"); or to great differences in space and time scales (bottle versus B-spiral); but there is still sufficient divergence that must be eliminated or resolved before this component of a global flux study has a sound basis.

3. Integrated Process Studies: The develop ment of sediment trap technology has led to an outburst of activity in different regions and in relation to a wide range of problems from near surface fallout to lithogenic transports. The diversity of use demonstrates the versatility of this technique, and these uses should continue. At the same time, for studies of the overall cycles in larger ocean regions, we need some integration of trap techniques, of sample analyses and of other methods (e.g., production: benthic chambers) to be used in close conjunction with trap deploy-

Given the consensus of a capability to carry out a major program on ocean fluxes, com-bined with the need to prepare for this by several immediate actions, the group proposed the following goals.

l. To determine whether we have the potential to obtain ocean data on a global scale that could profoundly change our under-standing of the flux of critical chemical constituenis.

2. To identify the immediate and longterm objectives needed to achieve the Global Ocean Flux Program.

the U.S. role in such an international pro-

4. To specify the immediate steps neces-

sary to assure that an appropriate program can be conducted within the next decade. To meet these goals, the group proposed there should be a 5-day workshop with 40 participants, which is tentatively scheduled to be held in Woods Hole during September 1984. It is to be chaired by Ken Bruland, Any questions or comments should be addressed

to Dr. Kenneth W. Bruland, Associate Profes. sor, Division of Natural Sciences, Applied Science Building, University of California, Santa Cruz, Santa Čruz, CA 95064.

This article was written by John H. Steele, Convenor, February 14-16, 1984, Workshop. He is with the Woods Hole Oceanographic Institution, Woods Hole, MA 02543.

Meetings

NATO Advanced Study Institute

The NATO Advanced Study Institute (ASI) will present lectures on modern numerical methods and physical parameterization for ocean circulation modeling for developing physical understanding. The models will encompass a broad range of subjects, includ-ing storm surge, mixed layer, eddy-resolving, quasi-geostrophic, primitive equation, and di-

The ASI will be held in Banyuls-sur-mer, France, from June 2-15, 1985. The director is James J. O'Brien, The Florida State University, Tallahassee, FL 32306. The French organizer and codirector is Michel Crepon, Lab. d'Oceanographie Physique, Museum National d'Histoire Naturelle, Paris, France. Principal lecturers are Alan Davies, U.K.; François Ronday, Belgium; Bert Semtner, United States; Mark Cane, United States; David Anderson, U.K.; and Lars Petter Roed, Norway. Several other lecturers will be selected in the near future. Bernard Saint-Guily is the local host.

Forty-five students from NATO countries will be chosen to attend the ASI. These people should be advanced graduate students. recent Ph.D.'s and research assistants with an interest to learn physical occanographic numerical modeling. Persons who wish to attend as a student should send a curriculum vitae and one or two references from professors in their country to Dr. O'Brien or Dr. Crépon by November 1, 1984.

All interested scientists are encouraged to apply to be a lecturer at the ASI. However, space is limited. A letter indicating the content of your lectures should be sent to Dr. O'Brien by October 1, 1984. From the applications, invitations will be issued to speakers. Lecturers are expected to attend for a minimum of 1 week.

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Urbana, Illinois ti1801
Telephone: 217-333-7732 or 333-3542
University of Illinois is an equal opportunity/affir mative action employer.

mative action employe

University of Texas at Auatin. The Department of Geological Sciences seeks to fill tenure track positions effective fall 1985 in one or more of the following disciplines: 1) micropaleontology-Tertiary biostratigraphy, 2) structure-tecturies, 3) hydrogeology, and 4) mineralogy-kinetics. Each person is expected to teach both undergraduate and graduate courses and to conduct a vigorous research program, including the supervision of graduate students, in the area of his or her speciality. The positions require the Ph.D. degree. Applicants should submit a detailed resume, names and addresses of five references, a statement of teaching and research interests, and a copy of their dissertation absence of the program of their dissertation absence of the secretary of their dissertation absence of the program of their dissertation absence of the program of the search interests, and a copy of their dissertation ab stract by December 1, 1984 to: Dr. William L. Fisher, Department of Geological Sciences, the University of Texas at Austin, Austin, Texas 78713–7909. The University is an equal opportunity/affirma-

Stanford University/Plasma Physics, EM Wayes, Space Physics. We are seeking a senior person who has demonstrated scientific, managerial, and leadership qualifications in one or more of the following disciplines: Space Plasma Physics, electromagnetic wayes, and solar-terrestrial physics. We expect the successful candidate to have established an outstanding reputation documentable through professional writings or other evidence of personal technical creativity, letters of reference from recognized research leaders in the disciplines mentioned above, and/or awards and office recognition from appropriate professional societies.

above, and/or awards and other recognition from appropriate professional societies.

It is expected that this individual will develop a research program in one of the disciplines given above working in coordination with ongoing programs within the STAR Caboratory and, possibly, with other activities within the Stanford Center for Space Science and Astrophysics. It is expected that this individual will have a smong background in experimental techniques, either in the laboratory or in the held, including the environment of space; experimental activities in either laboratory or space plasma physics would be regarded as good qualifications. However, close association with theoretical developments in plasma physics and/or electromagnetic theory will clearly by desired. It is also expected. that the individual will have a demonstrated capability for securing federal or other research grant support, or be decined by the selection committee of being capable of securing such funds.

It is anticipated that the person chosen will devote the major part of his or her time to research activities. However, there is no consequently for corriding.

the major part of his or her time to research activities. However, there is an opportunity for participation in academic responsibilities of Electrical Engineering Department, including, when time permits, teaching graduate and undergraduate classes, serving on various committees of the department, School of Engineering, and the University. It is expected that the person chosen will participate actively in the training of graduate students.

The Chairman of the selection committee for this position is Professor Robert A. Helliwell, Professor of Electrical Engineering, Space, Telecommunications, and Radioscience Laboratory, Stanford University, Stanford, CA 94305. Other members of the selection committee include Professor P.M. Banks, Professor R.N. Bracewell, Professor L.R.O. Storey, and Professor L. Tyler.

Project Associate/Specialist: Electron Micro-Probe Lab, University of Wisconsin-Madison. Strong analytical background in quantitative EMP analysis and familiarity with computers is required. The Lab has a 9-spectrometer ARL SEMQ and a JEOLCO 50-A SEM. Duties will include instrument maintenance, instruction of students, development of procedures and analysis. Research will be encouraged. A MS or PhD is required in Earth Science, Chemistry, Physics or Engineering. Minimum salary will be \$18,000/12 months with an MS. Send letter of application, transcripts, resume, and names and addresses of three references by September 15 to Dr. John W. Valley, Department of Geology & Geophysics, Weeks Hall, University of Wisconsin, Madison, WI 53706.

An equal opportunity employer

Satellite Geodesist. The scientific staff position satellité egodesiat. In estremar stait postion available 1 October 1984 at the Massachusetts Institute of Technology, Department of Earth, Atmospharic, and Planetary Sciences, in a federally sponsored long-term program of research in geodesy via radio interferometry with Global Positioning System (GPS) satellites. Candidates must have Ph. D. in geodesy, and ability and experience in radio interferometry with satellites, as demonstrated by substantial publications and reference reports. Expertise in FORTRAN scientific programming, in statistics, in the theory of satellite geodesy, and in parameter estimation techniques applicable to large, multi-parameter geodetic problems is essential. Experience in performing field work and in data processing on large IBM mainframe and/or small PDP-11 computer systems would be helpful, as would knowledge of the GPS, geodetic reference systems, and network adjustments. Strong skills in oral and written presentation of research results are required.

Please send vita, including list of publications, salary requirements, and references, plus reprints of major publications to:
Professor Charles C. Counselman, III clo L.M. Birchotte
Personnel Office, E19-238
M.I.T.
Cambridge, MA 02139

Cambridge, MA 02139
MIT is an allitimative action/equal opportunity

Geophysicist/University of North Carolins. The Department of Geology invites applications for a senure track faculty position in solid-earth geophysics beginning July 1, 1985. The position probably will be at the assistant professor level, but candidates at the associate professor level will be consid-

RESEARCH **POSITIONS** IN MARINE **GEOLOGY AND GEOPHYSICS**

Woods Hole Oceanographic Institution invites applications from researchers active in the fields of marine geology and geophysics to fill available positions on the scientific staff of the Department of Geology and Geophysics. We seek applicants at a broad range of experience levels, from Immediately post-doctoral to those with 10 or more years of research experience. Salary levels negotiable, depending primarily on background and experience

The Institution offers excellent facilities to carry out the full spectrum of practical and theoretical marine earth science research. A strong interest by candidates in conducting programs of marine G&C data acquisition and analysis is preferred; a capability to conceive, fund and corry out independent research programs is required. In addition to Geology and Geophysics, the Institution consists of 4 well-established research departments specializing in the fields of Biology, Chemistry, Physical Oceanography and Ocean Engineering. Collaborative research with members of the staff of these departments is strongly encouraged. Opportunities also exist for participation in the joint Massachusetts Institute of Technology - Woods Hole Oceanographic Institution graduate level education

Applicants should send resumes and names of 3 professional references to: Personnel Manager Box 54 P



OCEANOGRAPHIC INSTITUTION Woods Hole, MA 02543 An equal opportunity employer M. F. II

ered The Ph.D. is required, and post-doctoral experience wdestred. Our preference is for a seis-mologist and/or tectomophysicist, who would com-

mologist and/or tectonophysicist, who would com-plement current departmental activities, but any good applicant in geophysics will be considered. Faculty members are expected to conduct a visible and active recarch program, teach graduate and un-dergraduate students, and supervise theses. Inquiries and letters of application should be sent to P. Geoffrey Feiss, Department of Geology 029A, University of North Carolina, Chapel Hill, NC 27514. Applications must include resume, statement of research and leaching interests, and the names of a least three references. Closing date for applica-tions is October 19, 1984. UNC is an aftermative action/equal opportunity

UNC is an affirmative action/equal opportunity

Physical Oceanographer/Ocean Engineer. Evans-Hamilton Inc., an oceanographic consulting firm in Washington, D.C. area, has an opening for a physical oceanographer/ocean engineer at the MS or PhD level. Emphasis is in mmerical modeling of wind, wave, tides, and currents in estuary and on the shelf and also on solving related coastal engineering problems. Some experience in data aquisition and/or analysis is desirable. Salary is open. Company provides medical and profit sharing plans. Send resume to: Douglas J. Evans, Evans-Hamilton Inc., 354 Hungerford Drive, Rockville, MD 20850 or call 301-762-8070.

Soil Scientists Career Federal Service. The Agricultural Research Service U. S. Salinity Laboratory, in Riverside, California, has a position available for a scientist interested in conducting theoretical research on the transport of water and dissolved substances through soils. Research should result in a set of models that describe the behavior of salts and water in soil systems. Must have knowledge of advanced soil physics, soil chemistry, and soil-naterplant relations. Salary based on qualifications and experience, GS-11/12/13, \$25,489\$36,327. Applicants must be U.S. citizens. For application procedures call Rita Millard in Beltsville, Maryland, on 301-344-3138.

An equal opportunity employer.

An equal opportunity employer.

Cooperative Institute for Climate Studies/Announcement of Postdoctoral Fellowship. The Department of Meteorology at the University of Maryland, College Park has established the Cooperative Institute for Climate Studies (CICS) with NOAA to engage in collaborative research. The Institute is involved in a tariety of studies oriented toward a better understanding of climate and currently has an opening for a postdoctoral fellow to Join the current Institute stuff in the area of steady state climate modeling. This pusition calls for a meteorologist with experience or interest in experiments with steady state climate models. Principal activities will involve running experiments with existing steady state models, deriving careful verification protedures; handling extensive observed data sets, making modifications in model physics and forcing, and devising more efficient computational schemes for running the models.

Letters of application should be sent to: F. Baer, Director, CICS, Department of Meteorology, University of Maryland, College Park, MD 20742. Applications should include a curriculum vitae and names of three references. Applications received before, October 15, 1984 will receive full considerable.

allon.

The University of Maryland subscribes to a policy of equal educational and employment opportunity. The University of Maryland, under Title IX of the Education Amendment of 1972, does not discriminate on the basis of sex in admission, treatment of students or employment,

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RATES PER LINE

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al insertions \$1.50 Student Opportunities: first insertion free, additional insertions \$2.00.

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Replies to ads with box numbers should be addressed to Box, American Geophysical Union, 2000 Flouda Avenue, N.W., Washingion. IXC 20009. For more information, call 202-462-6903 or

toll free 800-424-2488. POSITIONS AVAILABLE

Department Head of Plant Sciences/University of Nevada Reno. The College of Agriculture, Uni-versity of Nevada Reno, is seeking applicants for this twelve-month tenure track position. The De-partment has ninescen faculty and conducts reachpartment has nineteen faculty and conducts teaching, research and extension programs in the areas of agronomy, horitculture and integrated pest management. A Ph.D. In a plant science telated discipline and evidence of administrative and leadership abilities are required. Glusing date for applications Is October 15, 1984. The position is available January 1, 1985. Contact Dr. Elwood Miller, Chairtoan, College of Agriculture, UNR, Reno, NV 89557—0004, 702-784-6611.

The University of Nevada Reno is an equal opportunity employer.

American Museum of Natural History. The Department of Mineral Sciences is seeking to fill a tentre track position for Assistant Curator beginning July 1985. This is mainly a research position, but some time is needed for collections management

and departmental activities. High quality sample oriented research and publication is the prime responsibility. The field of specialization is mineralogy, broadly defined, and may include and combine aspects of petrologic mineralogy, ore mineralogy, mineral geochemistry, crystal and thermochemistry, mineral physics, X-ray crystallography, ultrastructure analysis, crystal growth, spectroscopy or gemology. Major research facilities include a hilly automated ARISEMO electron microprobe, X-ray laboratory, minicomputer, and vast mineral and other collections. The opportunity exists for research and/or teaching collaboration with nearby institutions such as Columbia (Lamont-Doherty Geological Observatory).

Requirements are a Ph.D. in hand by the time of tent and art ability to carry out a resea apportunities and all assume research support program. It is expected that some research support will be sought outside the Museum. Applications should include: (1) a curriculum vitae, (2) names of three persons familiar with your work, and (3) a statement of research interests and specific projects to be carried out within the next five years.

These must be submitted by November 15, 1984 to:

Chairman, Search Committee
Chairman, Search Committee
Department of Mineral Sciences
American Museum of Natural History
New York, NY 10024
An equal opportunity (MF/H) affirmative action

Scripps Institution of Oceanography/Marine Geophysics. The Scripps Institution of Oceanography
invites applications for a tenure track position in
solid-earth geophysics/tectonophysics. The level of
the appointment will depend on the applicant's
qualifications. Candidates will be expected to supervise and conduct research in geophysical studies or
tectonophysics with emphasis on the ocean basins
and their margins. The position will also involve
graduate level teaching and the supervision of graduate student research. Applicants must hold Ph.D.
degree and have demonstrated excellence and independence in research in geophysics-tectonophysics.
Associate or Frofessorial level candidates must show
evidence of strong research record in their specialization; Assistant level candidates will be expected to
show evidence of their potential through publication
record appropriate for their experience and letters
of recommendation. Send letter of application in-

cluding description of research interests, list of publications, resume of teaching experience, and names of at least three references to; Chaiman, Graduste Department, A-008, Scripps Institution of Oceanography, University of California, San Diego, La Jolia, CA 92093. Closing date for applications is 15 October 1984. We expect to fill the position in calendar year 1985. ear 1885. An Equal Opportunity/Affirmative Action Em-phoyer, Women and minorities are especially invited

Senior Level Hydrogeologist. Requirements: M.S. + 5 years experience as Project Manager. Computer modeling and writing skills imperative. Strong background in applied hydrogeology integrated with chemistry and engineering desirable.

Remuneration: Commensurate with experience plus excellent benefits and growth potential.

Respond: In confidence stating interest, full resume, references and salary history to Mrs. V.L.

Borsos, R.E. Wright Associates, Inc., 3240 Schoolhouse Road, Middletown, PA 17057.

DIRECTOR

 Development of innovative solutions to ground-water problems; Preparation of successful proposals for major regional projects;

HYDROGEOLOGY DIVISION

Leighton and Associates, Inc., a rapidly growing Geotechnical Consulting Firm based in Southern California, has an opening for a Director to head its Hydrogeology Division. An MS degree in Hydrogeology from a major university and minimum 10 years industry experience, or a Ph.D. with a minimum 5 years industry experience or equivalent level of academic experience with publications is required. Responsibilities include:

 Management of field-oriented ground-water evaluation programs; Supervision of ground-water modeling efforts; Byaluation of hazardous waste contamination and cleanup procedures.

Leadership and self-starting qualities, strong client contact capabilities, excellent writing and communication skills will help qualify for this challenging position. Excellent benefits and salary commensurate with experience in a dynamic technical environment. Send resume and salary history to: 1151 Duryes Ave., Irvine, CA 92714.

Nominations for 1985 AGU Fellows

and the Section Selection committees. Nominees for Fellowship should be scientists

who have attained acknowledged eminence in a branch of geophysics. The total number

AMERICAN GEOPHYSICAL UNION

Nomination For Fellowship

Education (degrees, Institutions, major field)

Attach a list of most significant publications (not abstracts, book reviews, or papers

Attach a supporting statement which must include: (1) an indication of the length and

nature of your acquaintance with the nominee; (2) the nominee's contributions to the field to date; (3) your evaluation of the nominee's scientific ability; (4) a one-line citation,

Send nominations for lorwarding to your designated Section Selection Committee to:

"For", summarizing why the nominee should be elected a Fellow.

Sponsor's Title and Affiliation _____

Professional Record (including special honors) ______

Name of Sponsor

To be considered by the Committee, nominations for Fellowship in AGU must be made

of Fellows elected each year cannot exceed 0.1% of the total membership.

on the form below. If more space is needed, attach a separate sheet.

Name of Nominee

Personal Data on Nominee

Business Address (including position held) ______

Membership in Other Scientific Organizations ____

that have not yet been accepted for publication).

Sponsor's Evaluation of Nominee

For a list of current Fellows, write AGU.

AGU Member Programs

2000 Florida Avenue, N.W.

Nominations for Fellowship in the Union are being sought by the Fellows Committee

RESEARCH PHYSICIST, QM-18/14 ASTROPHYSICIST, OR \$56,827 T \$57,000 TERROPHYSICIST, OR \$56,827 T \$57,000 TERROPHYSICIST, OR \$56,827 T **GEOPHYSICIST**

The Spectroscopy Section of the Solar Physics Branch Space Science Division is enjaged in ultraviolet solar research by means of ground-based observations, sounding tockets, and manned and unmanned

We invite applications for the position of Project Scientist for a major satellite experiment which will fly on the Upper Atmospheric Research Satellite. The selectee will conduct investigations to develop the technical tools necessary to study the variability of the Sun in the ultraviolet spectium. He/She will be a co-investigator of the NRL-UARS experiment. In this capacity the selectee will conduct his/her own research in the area of solar variability and/or upper earth atmospheric physics

Qualifications required. A bachelors or higher degree in physics and at least three years of professional expenence which involved performing basic and/or applied research in the fields of optics, spectroscopy, solar physics, or geophysics.

Interested applicants should submit a Personal Qualifications Statement (SF-171) or detailed resume by 28 September 1984 to:

Faculty Position/University of Missouri-Columbia. The University of Missouri-Columbia invites applications for a tenure track provition to begin in August of 1985. Applicants will be expected to have completed requirements for the Ph.D. degree by that time. Appointment is expected to be made at the Assistant Professor level, but exceptional cases might be considered at higher rank. Faculty members are required to provide quality instruction at both undergraduate and graduate levels, and conduct research leading to scholarly publications. The following fields will be considered:

Hydrogodogy — preference will be given to a person with a strong mathematical/theoretical background in modeling of fluid flow, and with the capability and interest in guiding thesis research in water resources.

water resurces.

Notid-rath geophysics (to complement two seismulogists joining our staff in January 1985) — preference will be given to a person with research interest in heat flow, potential fields, or geophysical model-

ing.
Applicants should send resume, transcripts, and names and addresses of three references to:
Tom Freeman, Chairman
Department of Geology
University of Missouri
Columbia, MO 65211.

Columbia, MO 65211.

Harvard University/Faculty Position in Petrology.

The Department of Geological Sciences, Harvard University, invites applications for a faculty position in petrology. We are interested in persons concerned with the mineralogy and the major and/or trace element chemistry of metamorphic and igneous rocks in relation to their geology and tectonic setting. Experience with modern methods for the study of natural rocks, both in laboratory and in the field, is essential. The successful applicant must have the Ph.D. degree and demonstrated capabilities to conduct original research and to teach both undergraduate and graduate students. The appointment will be made at the Assistant or Associate Professor level depending on qualifications and experience. The 1984/85 salary ranges are \$26,600—\$28,200 for Associate Professor and \$30,600—\$353,600 for Associate Professor. Appointments are made for an initial term of up to five years, Interested applicants should send vita, bibliography, and names of three references to:

Professor Adam M. Dziewonski
Harvard University
Hoffman Laboratory
20 Oxford Street
Cambridge, MA 02138.

Harvard University is an equal opportunity/affirmative action employer. Women and minorities are encouraged to apply.

Faculty Positions/University of Colorado, Denver. The Physics Department of the University of colorado at Denver may be recruiting for several tenure track faculty positions to begin in the Fall Semester of 1985. We are especially interested in applicants for appointments at the level of Assistant Professor; however, we will also consider senior appointments for appropriately qualified applicants. The teaching assignment is anticipated to be a total of three courses per academic year, including involvement in the undergraduate laboratory program. A record of scholarly publications in referred journals will be required for advancement.

A successful candidate will be expected to provide high quality teaching over a broad range of undergraduate physics courses to students who are highly motivaled, and, because of our urban environment, somewhat older than the average college student. In

motivated, and, because of our urban environment, somewhat older than the average college student. In addition, our department is developing a research program to support graduate instruction primarily at the M.A. and M.S. degree level. We are looking for obysicists with research competence in one of the following areas: geophysics, environmental science, applied solar energy, or two-linear phenomena. Applicants should be willing to play a role in the development of a strong physics department supportive of related disciplines such as geology, engineering, chemistry, and mathematics.

If you would like to apply to join our faculty, please see that we receive a letter of application, a current resume, and three letters of recommendation. Applications must be postmarked before 15

terrent resume, and three fetters of recommenda-tion. Applications must be postmarked before 15 December, 1984. Please note that you are responsi-ble for having the letters of recommendation sent to us. Please send applications or inquiries to: Willard Chappell

Department of Physics

Division of Natural and Physical Sciences

1100 Kontreapth Street

1100 Foatteenth Street.
Denver, Colorado 80202.
The University of Colorado is an equal opportu-

The University of Kansas/Faculty Positions. The University of Ransas, Department of Geology seeks to fill three tenure track positions at the Assistant Professor level to begin in Fall, 1085. The Department seeks persons committed to scademic careers involving teaching, research, and service. Salaries will be determined by qualifications and experience and will be competitive. Candidates should hold the

(Salary dependent upon qualifications)

SPECTROSCOPY SECTION

SOLAR PHYSICS BRANCH SPACE SCIENCE

DIVISION NRL

NAVAL RESEARCH LABORATORY Civilian Personnel Division

Attn 41-58-13 I (EOS) 4555 Overlook Avenue, 5 W Washington, D.C. 20375

An Equal Opportunity Employer U.S. Cruzenship Required

Ph.D. degree in Geological Sciences or have it near

Ph.D. degree in Geological Sciences or have it near completion.

All positions carry responsibility for teaching at both undergraduate and graduate level, conducting active programs of research and publication, and supervising the research of students. Candidates should expect to teach introductory courses as well as in their specialities. The Department may give preference to those who are qualified physically and by training or experience to teach in our summer field programs and have the capability to use the computer to solve geological problems.

Position 1. Sedimentation, with interests in the interface between sedimentary processes and stratigraphy, diagenesis and low-temperature geochemistry, or tectonics. Duties will include teaching courses in stratigraphy, sedimentation, sedimentary processes and sedimentation, igneous phenomena, or metamorphism. Duties will include teaching courses in structural geology and tectonics or petrology. Candidates with field orientation will be preferred.

Position 3. Geophysics, with interests in seismology, crustal structure, or potential fields. Candidates behand every to interest with attent and the season in the season in the preferred.

Position 3. Geophysics, with interests in seismology, crustal structure, or potential fields. Gandidates should expect to interact with a strong group in the Kansas State Geological Survey and coordinate the academic aspects of the program in geophysics. Duties will include teading corses in geophysics, crustal structure, or tectonics.

Applicant should send a resume, academic transcripts, and at least three letters of recommendation to: M.E. Blckford, Chairman of Search Committee, Department of Geology, University of Kansas, Lawrence, Kansas 66045–2124. Application materials must be received by 5:00 p.m. November 19, 1984. The positions are contingent upon availability of funds.

The University of Kansas is an AA/EEO employer and encourages applications from all qualified per-

Department of Geology and Geophysics/University of California, Berkeley. Subject to final budgetary approval, the Department is authorized to make two faculty appointments, one at the senior level and one at the junior level, and anticipates making two further appointments next year. Applicants with an outstanding record of research in any field of geology and geophysics are encouraged to apply. The ability to carry out leading research, as well as an interest in teaching graduate and undergraduate students, are major factors in the selection. Applications, including the names of at least three references, should be sent by December 15, 1984 to the Search Committee, Department of Geology and Geophysics, University of California, Berkeley, California 94720.

The University of California is an equal opportu-

arnia 94720. The University of California is an equal opportu-lty/affirmative action employer.

Postdoctoral Research Position/Petrology-Geo-chemistry: Northern Illinois University, Depart-ment of Geology. Recent Ph.D. recipient is sought for one year position starting in early 1985. Strong analytical background in XRF or plasma spectrome-try is preferred. The Department of Geology is in try is preferred. The Department of Geology is in the process of acquiring new, automated XRF and DC plasma spectrometers. The successful candidate will be involved in the development of aample-preparation, analy: "al, and data-reduction procedures, as well as instruction of other users, independent or collaborative research will be expected. The Department also has solid- and gas-aource mass spectrometers, automated EMP, and excellent computing facilities. Please send aoulication, resume

puting facilities. Please send application, resume, and the names of three references to J.H. Berg, Departme of Geology, Northern Illinois University, Dekalb, IL 60115. Application deadline is October 14, 1082. ern Illinois University is an affirmative ac-

Academic Administrator/Assistant or Associate Research Oceanographer. The Center for Coastal Studies, Scripps Institution of Oceanography has an opening for a aplit-position-50% Academic Administrator/50% Assistant/Associate Research Oceanography

rapher.
The Center conducts a wide variety of field, labo-

The Center conducts a wide variety of field, laboralory and theoretical work in waves, currents, shore processes, mechanics of nearshore sediment transport, estuarine processes, continental shelf and marginal seas research

The successful candidate will have a PhD in physical oceanography or coastal sciences. The level of appointment will be determined by experience and level of independence in his/her field as evidenced by reviewed publication record in the scientific literature and research record. The ability and desire for interaction with a variety of people within and outside the University, particularly funding agencies, are essential. Knowledge of a broad spectrum of research areas is also essential. Some understanding of administrative issues, e.e. personnel and budgets, is essential.

The Administrator portion of the position is permanently state-funded. The Research portion will be funded by the Center for 18-18 months to en-

able the candidate to later obtain contract/grant funding either separately or in cooperation with

other department researchers.

Send resumes, including areas of research interest and list of publications, with three letters of reference by 31 October 1984 to:

Dr. Douglas L. Inman, Director Center for Coastal Studies, A-0.00 Scripps Institution of Oceanography University of California-San Diego

La Jolla, CA 92093.

UCSD is an Equal Opportunity/Affirmative Action Employer.

Monash University, Victoria, Australia: Department of Earth Sciences Continuing & Fixed-term (3 Year) Lectureships/Senior Lectureships in Geophysics. Commercing early 1985. One position for a scientist with research expertise in any of: theoretical seismology, solid Earth geophysics, tectonophysics, geodynamics, or exploration geophysics, and one position for a scientist with demonstrated research ability in exploration seismology. Possible extension of fixed-term position to 5 years. Appointees to establish research programmes involving industry and government support, develop an undergraduate and graduate program covering applied and theoretical geophysics, and supervise Master's and Ph.D. students. Applicants with expendent in thermomechanical modelling will find an environment with strong interest in mechanisms of deformation, fluid/rock interaction including mass transport and thermal modelling, and physical volcanology. Enquiries to Dr. Ian A. Nichollis. Salary: Lecturer—\$A23,331—\$A38,847 p.a. Applications including Ref. no. 41512P, curriculum vitae including description of research and teaching interests, and three referees to the Registrar, Monash University, Clayon, Vic. 3168 Australia, by 1st October 1984. An Equal Opportunity Employer.

University of Wisconsin-Milwaukee/Faculty Position in Aimoapheric Sciences. The Atmospheric Sciences option in the Department of Geological and Geophysical Sciences will have a tenure track/tenured position supported by State funds at the Assistant Professor/Associate Professor level starting January, 1985. Starting salary will depend upon the candidate's experience and will be competitive with other universities. Applicants must have a Ph.D. in meteorology or atmospheric sciences and the intent to pursue a career in teaching and research. We are seeking an individual with research interests in one or more of the following specialties: micrometeorology; mesoscale meteorology and modeling; synoptic dynamics; or climate dynamics and modeling. The successful applicam will be expected to develop a strong research and graduate program in his or her area of expertise and to teach two courses (3 cr. each) per semester at the undergraduate and graduate level.

Research opportunities at UWM include satellite Research opportunities at UWM include satellite meteorology, severe storm dynamics and energetics, diagnostic modeling, large-scale circulation and energetics, synoptic meteorology and numerical modeling. Research facilities include McIDAS, Great Lakes Research Facility, Urban Research Center, and a rural field station. Interested candidates should forward their resume to: Professor N.P. Lusca, Chair, Department of Geological and Geophysical Sciences, University of Wisconsin Milwaukee, P.O. Box 413, Milwaukee, Wisconsin 59201, with transcripts and the names of three persons well acquainted with the applicant's background and research potential. Closing date is October 31, 1984. UWM is an affirmative action/equal opportunity employer.

College of Geosciences/University of Oklahomi College of Geosciences/University of Oklahoma, Applications and nominations are invited for the position of Director of the School of Geology and Geophysics. The Director is expected to have a Ph.D. or equivalent, a strong, ongoing research program and administrative experience; industrial experience helpful; field of geological specialization open; to begin July 1, 1985; salary to be negotiated. In 1986, the School will move into the new 300,000 sq. ft. Energy Center along with other elements of the College of Geosciences; the Oklahoma Geology Survey; and the School of Petroleum and Geological Engineering and the School of Cliemical Engineering and Materials Sciences, both from the College of Engineering. Applications with curiculum vitae, names and addresse of three references, and/or nominations should be sent to:

direses of three references, and/or normations nould be sent to:

Francis G. Stehli, Dean
College of Geosciences
University of Oklahoma
601 Elm Street, Room 438C
Norman, Ok 73019.
Consideration of applications will begin January

, 1985. The University of Oklahoma is an Equal Oppor-unity/Affirmative Action Employer.

Marine Research Specialist IV/V. Two positions. Develop program related to processing and display of data from Sea Beam Sonar System. Operate and maintain complex electronic systems onboard ships, up to three months sea time per year. Supervise shipboard and shore based operations. Maintain hardware and software. Develop software for digital acquisition of Sonar and Navigation data. Analyze marine navigation, Bathymetric and acoustic data through use of advanced signal processing, interactive graphics and map making techniques. Master's degree or equivalent in Computer Science, Physical Science or Engineering or equivalent experience. Proven programming ability in FORTRAN and ASSEMBLY languages, and VAX/VMS operating systems required. A working knowledge of computer electronics as well as experience at sea is strongly preferred. Submit resume by September 14, 1983 to: Dr. Robert C. Tyce, Marine Research Specialisa IV/V Position, THE UNIVERSI. TY OF RHODE ISLAND, P.O. Box 357, Kingston, R.I. 02881-0357.

An AA/EOE m/f.

An AA/EOE m/f.

William M. Rice University/Marine Geophysics.
The Department of Geology invites nominations and applications for the W. Maurice Ewing Chair in Oceanography. We are seeking applicants for a new position in marine geophysics to fill this chair.

The Department of Geology has recently added two reflection seismologists to its faculty and is building a state-of-the-art seismic processing facility. The successful applicant will be expected to teach graduate and undergraduate courses and to develop a strong research program in his or her area of interest. Cooperation in ongoing research with other members of the Rice faculty and faculty at other Texas universities would be encouraged. Send enquiries and applications to Dr. Albert Bally, Chairman, Department of Geology, Rice University, Houston, Texas, 77251–1892. Applications should include a detailed resume, the names and addresses of three references, and a statement of research interest.

Rice University is an equal opportunity/affirmative action employer.

Research Geophysicist. The U.S. Geological Survey (USGS); Office of Earthquakes, Volcanoes, and Engineering. Branch of Scismology is soliciting interest from exceptionally well-qualified persons with either a record of demonstrated ability or outstanding potential for research in one or more areas of Branch actifity. The Branch of Seismology conducts fundamental research in the fields of carringtake

EARTH SCIENCES

The Lamont-Doherty Geological Observatory of Columbia University invites recent Ph.D. recipients or candidates for their degree in 1985 in any field of the earth sciences to apply for postdoctoral fellowships awarded for a period of one year (extendable to two years, in special instances) beginning in September 1985 with a stipend of \$26,000 per

Completed applications are to be returned by January 15, 1985. Application forms may be obtained by writing to the Director, Lamont-Doherty Geological Observatory, Palisades, New York 10964. Award announcements will be made on or about February 28, 1985.

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prediction, network seismology, crustal structure and volcano seismology. The Branch is particularly interested in a geophysicist with expertise in the field of seismology.

All interested persons should submit a detailed resume of education, experience, summary of interests and research intentions, and the appropriate salary level commensurate with experience by 5 October 1984 to:

William Ellsworth

William Ellsworth U.S. Geological Survey Branch of Seismology 345 Middlefield Road, MS-977

Menlo Park, CA 94025.

Should a position become available in the Branch, you will be notified of the competitive Federal employment application requirements.

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University of Utah: Structual Geology/Tectonics/
Tectonophysics. The Department of Geology and Geophysics at the University of Utah seeks applications for a tenure track position in structural geology, tectonics or tectonophysics. It is anticipated that his position will be filled at the assistant professor level, but applications by more senior persons will be considered. The position requires a Ph.D. with emphasis in structural geology, regional tectonic or tectonophysics. The new faculty member will have the opportunity to teach in the area of his or her specialty and may also be assigned introductory level courses. The successful candidate will be expected to establish a vigorous research program involving graduate students. The person who fills this position will join an active program in structural geology and tectonics that includes both field projects and integrated geology/geophysics ans mechanics/fluid chemistry studies of structures in the western Cordillera. There is an excellent opportunity to collaborate with other faculty in structural geology, sedimentology, geophysics, geochemistry and petnoory. A vita cornies of rubilications, names of three taborate with other faculty in structural geology, sedimentology, geophysics, geochemistry and petrology. A vita, copies of publications, names of three persons that may provide references, and a letter outlining the candidate's research and teaching interests should be sent to Dr. William P. Nash, Chairman, Department of Geology and Geophysics, University of Utah, Salt Lake City, Utah 84112-1185, Deadline for receipt of applications is December 31, 1004.

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STUDENT OPPORTUNITIES

Predoctoral Research Assistantship in Geochemistry. Individuals are invited to apply for a research

<u>Meetinas</u>

Oct. 8-10, 1984 18th Annual Association

land, Oreg. (Association of Earth Science Edi-

Topics to be discussed include concerns of

tors, 4220 King St., Alexandria, VA 22302.)

the working editor in editing and preparing manuscripts and illustrations (including the

house training programs, understanding how

illustrations communicate, changes in meth-

ods of making maps, and compatibility of

electronic tools); managing journals and im-proving the journal publication process; in-terfacing between publishers and printers;

getting reviewers to do their job; applying

microcomputers to journal management; abstracting and indexing services: their needs

information specialists, and journalists, and

the responsibilities of those issuing and re-

Nov. 30-Dec. 1, 1984 NASA/Lunar and

Mars (part of Mars: The Evolution of its Cli-

mate and Atmosphere), Moffett Field, Calif.

Planetary Institute Workshop on Water on

porting hazards information).

Water on Mars

use and development of style guides, in-

of Earth Science Editors Conference, Port-

Announcements

Earth Science

Editors Meet

(NASA/LPI Project Office, 3303 NASA Road 1, Houston, TX 77058.) Indication of interest due September 15,

assistantiship in geochemistry leading to the Ph.D. A masters degree in some field of geological science is desirable. Research project will involve a geochemi-cal study of Precambrian crustal development. Ap-plicant pure he accounted in the Ph.D.

cal study of Precambrian crustal development. Applicant must be accepted in the Ph.D. program at New Mexico Tech. Research appointment is for 12 months beginning in January 1985. Applicants should send a copy of their vita together with an outline of their research interests and arrange for transcripts and three letters of recommendation be sent to Dr. Kent C. Condie, Department of Geoscience, New Mexico Institute of Mining and Technology, Socurto, NM 87801 by no later than 15 October 1984.

New Mexico Tech is an equal opportunity/affir-mative action employer.

1984. Abstracts are due October 26, 1984. This workshop will address various questions regarding the present and past water cycles on Mars, the sources and sinks for water, and the current and past bulk water con-

Australian Physical Oceanography Conference

February 10-15, 1985 Australian Physical Oceanography Conference, Hobart, Tasmania. Convenor: Eric J. Lindstrom. (Eric Lindstrom, CSIRO Marine Laboratories, GPO Box 1538, Hobart, Tasmania, Australia, 7001; (el.: 002-20-6222.)

Those who send notice of their intent to attend the conference by September 15, 1984, will be eligible for a reduction in the registration fee.

and value; strategic planning; writing and improving newsletters; reporting scientific hazards (including the roles of scientists, editors, This biennial meeting of scientists and students interested in the physical dynamics of the oceans provides a forum for the presentation and discussion of research results. Papers and/or poster presentations in all areas of physical oceanography are encouraged. Special sessions may be organized that bring to-gether talks of common interest, such as the ustralian Coasial Experiment, Bass Strait, North-West Shelf, Great Barrier Reef, Ocean Climate, Fine and Microstructure, Tides, and Nutrient Cycling. There will be a cash award of \$100 presented for the best student paper.

AGU Membership Applications

Applications for membership have been received from the following individuals. The letter after the name denotes the proposed primary section affiliation.

Regular Members

Abdulaziz Alharthi (SS). Nancy Alyanak (S), Eli Arich (S), Paul Berkman (O), R. R. Brook (A), Paul E. Buchholz (T), Arthur Bundy (G). Herbert T. Buxton (H), Diana L. Bynum (H).

Andrew Callegari (S), Kathleen Campbell (V). John Canle (V). Songlin Cheng (H), George K. Cotton (H), David J. Doherty (V), C. W. English (H), Dara Entekhabi (H), Eberhard Fahrbach (O), P. M. Fleming (H), Rougerie Francis (C), Longe J. Francis (CP) gerie Francis (O), James J. Frawley (GP), Zhufeng Fu (SS).

Edward Gaw (O), Cinda Graubard (T), Cuhekin Gunay (H), Mohamed T. Hadidi (S), Jerry Hatfield (H), James D. Hays (T), Jean Hernandez (V), Diem Ho (A), David Hochmuh (H), James C. Ingle (V). Dan B. Jaynes (H), Wolfgang Kokott (P),

Paul R. Lagace (H), Robert Lenhard (H), Barry Lester (H), Margaret Mangan (V). nas W. May (S), Charles O. Meyer (S), J. B. Miller (H), Kula C. Misra (O), Frederick F. Mobley (GP), Lisa A. Mondy (H).

Yujiro Ogawa (T), Jon Steen Petersen (V), David M. Peterson (V), K. Ramachandran (H), D. A. Rothrock (O), Juergen Rueffer (G), Michiel M. Rutgers vd Loeff (O), Clifford Schenkel (S), Pedro Cunha Serra (H), Om P. Sharma (SS), John M. Sharp (H), Jonathan Sharp (O), Thomas J. Sokolowski (S), John S.

Akira Takeuchi (T), Michael C. Ten Raa (V), Vasilis P. Tritakis (SS), Kristian Tryggvason (S), David M. Tuck (H), Michael L. Voorhees (H), Qinliang Wang (H), Graham J. Welr (H), Frank L. White (H), Terrie Winneu (V), Clarence Worrell (S), Bruno Zolesi (SA), Alan H. Zorn (G).

Student Status

David Allen (A), Chuck Ammon (S), Sergio Barrientos (S), C. Jay Beegle (O), Kate Berry (H), June L. Bigler (H), Michael Bruno (O), Nicholas Bugosh (H), John M. Callaham (V), Thomas C. Cambareri (H), John Cook (T).

Joe Denner (H), Jim De Verse (CS), Steven R. Dunn (V), Gary D. Egbert (GP), Samuel P. Pennsylvania State
Park, PA 16802.

Figuli (T), Jim Finley (H), Martin Freed (O), Wayne B. Gardiner (S), Erik B. Goodwin (S). Marc R. Hairston (SM), Stuart Henrys (S),

Thomas L. Hurst (H), Douglas M. Johnston (H), Richard Kelsey (H), William S. Kessler (O), Gregory A. Lawrence (O), Jacqueline S. Lee (V), Saulwood Lin (V), Darryl Luce (T), Furaha N. Lugoe (G). Stephen Marks (V), Garry Maurath (V),

Mark A. Meadows (S), Wendy Melgin (H), Robert H. Montgomery (H), Ronald D. Moyer (T), Susan Novak (S), Delia Oppo (O), Douglas B. Ross (GP), Steven Ruppert (S).

Robert Schellhorn (S), Gary Shanks (H), Kwoktai Shum (O), James Edwin Smith (H). Howard A. Snyder (V), Kenji Sone (T), A. H. Spitz (V), Daniel J. Stein (V), Catherine L. Summa (H), Cathy Jean Wilson (H), Randal T. Wortman (H), Michael H. Young (H), James Zachos (O).

Proposed Change in the AGU Bylaws

On May 15, 1984, the AGU Council gave initial approval to an amendment to Bylaw 11 that would remove the Membership Committee as a Standing Committee. The change was recommended by the Executive Committee for three reasons:

 The functions of the committee a originally designed (i.e., to promote and process membership) are now handled entirey by staff. The Membership Committee has func-

tioned for the past several years as an oversight committee for the Union: as such, it is not correctly named, and all of the proposed activities can be covered by other committees 3. If there is a need for some form of committee to address membership issues in

the future, it can be promptly established as a special committee. Notice of this proposed change is given in accordance with Article 12b of the Statutes,

which requires that proposed amendments to the Bylaws be published in an AGU publica-tion of general circulation no less than 30 days prior to a second consideration by the Council. The Council will consider this proposal for final passage at its December meet-

Ing.
The Statutes and Bylaws Committee welcomes comments from the membership on the proposed change. Please send comments to Shelton S. Alexander, 403 Deike Building, Pennsylvania State University, University

Deadline: September 17, 1984

Separates

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0930 Salimaic methods SELSMIC RECIPROCITY FIELD TESTS FROM THE STALLAR

SEINIC EECIPOCITY FIELD TESTS FROM THE STALLAR PEPERSULA
D. Jenail (AGIP S.p.A., P.O. Son 12069, 20120 Hilsno, Italy) F. Esca
The conditions for applicability of the reciprocity theorem, commonly toward in assumic data gathering, era carely see in usual practice.

A fuel in usual practice.

A fuel the was conducted in an area therecturized by remarkable thhomogeneities of the surface layers to assess quentitatively the discrepancies between direct and reciprocal traces; the sacray sources used were both of vibratory and impulsive type.

The results show that the cohorance between the two traces is good, except for the case of short offsets and early clean with esplosive sources. The vibratory source, aven if theoretically "more reciprocel" than the explosive sources, the sacriprocel" than the explosive one, yields coherencies in the sacrirence, and is less uniform along the frequency axis.

GEOFMYSICS, Vol. 49, NO. 10

OB30 Seissic methods
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PETHOGRAPHIC CONNECTER OF CARBONATE ROCKS
7. Esfevich (Guif Assessen and Davelapment Company, P.O.
Son 37048, Equation, TX 77099) C.R. St. C. Kendell, and

Exploration Geophysics

6930 Seismic methods

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